OSMOTIC COEFFICIENTS AND MEAN ACTIVITY COEFFICIENTS OF A SERIES OF UNI-UNIVALENT ELECTROLYTES IN AQUEOUS SOLUTIONS AT 25°C.

Prepared for
National Aeronautics and Space Administration

NASA Contract Number: R-09-022-029

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ELECTROCHEMICAL DATA

PART XIII

OSMOTIC COEFFICIENTS AND MEAN ACTIVITY COEFFICIENTS
OF A SERIES OF UNI-UNIVALENT ELECTROLYTES IN
AQUEOUS SOLUTIONS AT 25 °C.

by
Yung-Chi Wu and Walter J. Hamer

Prepared for
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Electrochemical Data. XIII. Osmotic Coefficients and Mean Activity Coefficients of a Series of Uni-univalent Electrolytes in Aqueous Solutions at 25 °C.

ABSTRACT

This report gives the osmotic coefficients and the mean activity coefficients of a series of uni-univalent electrolytes in aqueous solutions at 25 °C. The values are expressed on the molality or weight basis. The electrolytes treated are: NaF, KF, RbF, CsF, NaClO₃, KClO₃, NaBrO₃, KBrO₃, HClO₄, LiClO₄, NaClO₄, TiCl₄, LiOH, NaOH, KOH, CsOH, HNO₃, LiNO₃, NaNO₃, KNO₃, RbNO₃, CsNO₃, AgNO₃, NH₄Cl, NH₂NO₃, NH₄ClO₄, NaCNS, KCNS, NaH₂PO₄, KH₂PO₄, NaH₂AsO₄, and KH₂AsO₄.

I. Introduction

This report represents a continuation of the work presented in Electrochemical Data, Part XI. Again the literature data were fitted to the equation for the excess Gibbs energy (free energy):

$$\Delta G^{\text{ex}} = \nu m \text{RT} (1-\phi_m + \ln \gamma)$$  \hspace{1cm} (1)

where \(\nu\) is the number of ions into which one molecule of solute (electrolyte) dissociates, \(m\) is molality, \(R\) the gas constant, \(T\) the Kelvin temperature, \(\phi\) the osmotic coefficient, and \(\gamma\) the activity coefficient on the molality scale. Values of \(\Delta G^{\text{ex}}\) as a function of \(m\) were determined by using the following equations for \(\phi\) and \(\gamma\):

$$\phi_m = 1 - 2.302585 \left[ \frac{z^+ z^- \Lambda_m}{(B_m^*)^3 m} \left[ 1 + B_m^* \sqrt{m} \right] - 2 \ln \left( 1 + B_m^* \sqrt{m} \right) - 1/(1 + B_m^* \sqrt{m}) \right]$$

$$+ 2.302585 \left[ \beta_m/2 + 2C_m^2/3 + 3D_m^3/4 + 4E_m^4/5 + \ldots \right]$$  \hspace{1cm} (2)
and

$$\log \gamma = -\frac{|z^z|A^{\pm m}}{1 + B^{m/m}} + \beta m + C m^2 + D m^3 + F m^4 + \ldots \ldots \quad (3)$$

Substitution of equations (2) and (3) in (1) gives $\Delta G^{\text{ex}}$ as a function of $m$, namely:

$$\Delta G^{\text{E}} = \nu RT (2.302585) \left\{ \left[ |z^z| A^{+m} / (B_m^{*})^3 \right] \left[ (2 - B_m^{*}m)B_m^{*}/m \right] 
- 2 \ln (1 + B_m^{*}/m) + \beta m^2/2 + C m^3/3 + D m^4/4 + E m^5/5 + \ldots \ldots \right\} \quad (4)$$

The parameters $B_m^{*}$, $\beta$, $C$, $D$, and $E$ were then obtained by least squares using a computer program. These parameters were then used to express $\phi$ and $\log \gamma$ individually by equations (2) and (3) above. The standard deviations of the fit of these equations are denoted, respectively, by $S_\phi$ and $S_\gamma$ and are given at the bottom of each table. In these least square fits values of $B_m^{*}$ were selected that made $S_\phi$ and $S_\gamma$ minimal. Terms with coefficients of $D$ and $E$ were required only for those electrolytes for which data were available at very high concentrations (above about 3M). [Note: inadvertently, in report Electrochemical Data, Part XI the ion-size parameter, $a$, was omitted from equations III.9, III.10, and III.11. In each equation the constant $B$ should be replaced by the notation $B_{m}^{*}$ where the subscript $m$ means molality and makes the constant consistent with that given in equations II.5 and II.6 of that report. Also in equation III.31 $B_m^{3}$ should be $(B_{m}^{*})^3$ and $B_m^{*}$ should be $B_{m}^{*}$. In this report $B_{m}^{*}$ is replaced by $B_m^{*}$ thus removing the physical significance to this parameter and making it empirical.
II. Results

The results are given in tables 1 to 32, inclusive. In each case the values are those calculated by the above equations and represent the best fit to the experimental data.

III. References

(For data at 25 °C only)

NaF

   Emf: NaHg|NaF(m)|PbF$_2$, PbHg
   m = 0.05 - 0.9 m (saturated at 0.983 m)
   Isopiestic vapor pressure: m = 0.1 - 4.0: φ and γ

KF

   Isopiestic vapor pressure: m = 0.1 - 4.0: φ and γ
   Isopiestic vapor pressure: m = 2.0 - 17.5: φ and γ

RbF

   Isopiestic vapor pressure: m = 0.1 - 3.5: γ and φ

CsF

   Isopiestic vapor pressure: m = 0.1 - 3.5: φ and γ
\[ \text{NaClO}_3 \]

Isopiestic vapor pressure: \( m = 0.2 - 3.0 \): \( \phi \) and \( \gamma \)

\[ \text{KClO}_3 \]

Isotonic solutions: \( m = 0.2 - 0.7 \): \( \phi \) and \( \gamma \)

\[ \text{NaBrO}_3 \]

Isotonic solutions: \( m = 0.2 - 2.617 \) (saturated): \( \phi \) and \( \gamma \)

\[ \text{KBrO}_3 \]

Isotonic solutions: \( m = 0.15 - 0.50 \): \( \gamma \) and \( \phi \)

\[ \text{HClO}_4 \]

Emf: \( H_2 || \text{HClO}_4 || \text{HClO}_4 || H_2 \)

\( m = 0.01 - 0.10 \): \( \gamma \)


Vapor pressure: \( m = 0.0 - 12.0 \): \( \gamma \)


Isopiestic vapor pressure: \( m = 0.1 - 16 \): \( \phi \), \( \log \gamma \)


Isopiestic vapor pressure: \( m = 0.1 - 16.0 \): \( \gamma \), \( \phi \)
LiClO$_4$

Isopiestic vapor pressure: $m = 0.2 - 4.5$: $\phi$ and $\gamma$

$\gamma$ calculated from diffusion coefficient data. Concentration in moles/liter $c = 0.0005 - 0.020$: $\gamma$

NaClO$_4$

Isopiestic vapor pressure: $m = 0.2 - 6.5$: $\gamma$, $\phi$

[Note: $t = 25 \pm 1.0 ^{\circ}C$] Isopiestic vapor pressure: $m = 4 - 16$:
$\gamma$ and $(1 - \phi)$ ["Salt dried to constant weight in oven at 110 $^{\circ}$C. No further purification attempted."]

Isopiestic vapor pressure: $m = 6 - 16$ (even concentrations):
$\phi$ and $\gamma$

TlClO$_4$

Isopiestic vapor pressure: $m = 0.025 - 0.5$: $\gamma$

LiOH

Emf: $H_2|\text{LiOH}(m_2)|\text{Li}^+\text{Hg}|\text{LiOH}(m_1)|H_2$
$m = 0.9505 - 3.926$: $\gamma$

Vapor pressure measurements: $m = 0.5 - 5.0$ ($\gamma$)
$m = 1.0 - 5.0$ ($\phi$)
NaOH


\[
\text{Emf: } H_2 | \text{NaOH(m)}_2 | Na_x Hg | \text{NaOH(m)}_1 | H_2 \\
m = 0.0202 - 3.10: \gamma
\]


\[
\text{Emf: } H_2 | \text{NaOH(C2)} | Na_x Hg | \text{NaOH(C1)} | H_2 \\
m = 0.0202 - 3.10: \gamma
\]


\[
\text{Emf: } H_2 | \text{NaOH(C1)} | Na_x Hg | \text{NaOH(C2)} | H_2 \\
m = 0.01004 - 2.825: \gamma
\]


\[
\text{Emf: } H_2 | \text{NaOH(m)} | Na_x Hg | \text{NaOH (0.05)} | H_2 \\
m = 0.05 - 4.0: \gamma
\]


\[
\text{Emf: } \text{Hg} | \text{HgO, NaOH(m)} | H_2(Pt) \\
m = 0.1 - 0.9
\]

Activity of water in NaOH-H_2O solution calculated.


Isopiestic vapor pressure: \( m = 2.0 - 29.0: \phi \) and \( \gamma \)


Vapor pressure: \( m = 5.085 - 13.834 \) water activities


Vapor pressure: \( m = 1.0 - 27.0: \phi \)
KOH


\[ \text{Emf: } \text{Hg} + \text{H}_2\text{O}, \text{KOH(C}_1\text{)}, \text{K in Hg, KOH(C}_2\text{)}, \text{HgO} + \text{Hg} \]
\[ m = 0.003 - 1.00: \gamma \]

[Note: See M. Knobel, J. Am. Chem. Soc. 45, 70 (1923) for a revision of this work. Chow did not exclude air from his solutions.]


\[ \text{Emf: } \text{H}_2 | \text{KOH(C}_1\text{)}, \text{Hg}_{x} | \text{KCl(C)} | \text{KOH(C}_1\text{)} | \text{H}_2 \]
\[ m = 0.001 - 3.0: \gamma \]


\[ \text{Emf: } \text{H}_2 | \text{KOH(C}_1\text{)}, \text{KCl(C)} | \text{K}_x \text{Hg} | \text{KOH(C}_1\text{)} | \text{H}_2 \]
\[ m = 0.03 - 3.0: \gamma \]


\[ \text{Emf: } \text{H}_2 | \text{KOH(aq., M)} | \text{K}_x \text{Hg} | \text{KOH(aq., M = 0.05)} | \text{H}_2 \]
\[ m = 0.05 - 4.0: \gamma \]


Vapor pressure: \( m = 1.0 - 20.0: \gamma, \phi \)

CsOH


\[ \text{Emf: } \text{H}_2 | \text{CsOH(m)} | \text{Cs}_x \text{Hg} | \text{CsOH(0.05)} | \text{H}_2 \]
\[ m = 0.01016 - 1.3205: \gamma \]
   Emf: Pt|Q(sat), HNO₃(m', fixed)|HNO₃(m, variable), Q(sat)|Pt
   Q = quinhydrone
   c = 0.001021 - 0.2040; -log γ

   Emf: Glass electrode|HNO₃(m₁)|HNO₃(m₂)|glass electrode
   m = 0.01 - 0.10; γ

   Liquid vapor equilibrium measured for binary system HNO₃-H₂O
   for compns. of liquid phase from 0 to 68% HNO₃.

   Combines new transpiration data on partial pressures of HNO₃
   c = 2 - 16 m/ℓ; γ

    Chem. 69, 97 (1965).
    Isopiestic vapor pressure: m = 2.0 - 28.0; γ and φ

    Vapor pressure measurements: m = 0.00 - 12.8693; γ

    Isopiestic vapor pressure: m = 0.1 - 3.5; γ

    Isopiestic vapor pressure: m = 0.1 - 13.5; φ and γ
LiNO₃ (continued)

   Diffusion coefficients: c = 0.0005 - .020: γ

   Vapor pressure: m = 1.0 - 20.0 (ϕ)
   m = 0.5 - 5.0 (γ)

NaNO₃

   Isopiestic vapor pressure: m = 0.1 - 6.0: γ

   Vapor pressure: Activity of H₂O and apparent and partial molal volumes of the salts in these solutions were calculated.
   m = 0.1 - 10.830 (saturated)

   γ calculated from diffusion coefficient data
   c = 0.005 - 0.020

   γ calculated from diffusion coefficient data
   c = 0.003 - 0.015

   Vapor pressure: m = 0.1 - 10.0: ϕ

KNO₃

   Isopiestic vapor pressure: m = 0.1 - 3.5: γ
KNO₃ (continued)

Differential diffusion coefficients:  c = 0.00 - 0.00919

Diffusion coefficient data
\[ c = 0.0005 - 0.020: \gamma \]

Vapor pressure:  \( m = 1.0 - 3.0: \phi \)

RbNO₃

Isopiestic vapor pressure:  \( m = 0.1 - 4.5: \gamma \) and \( \phi \)

CsNO₃

Isopiestic vapor pressure:  \( m = 0.1 - 1.5: \gamma \) and \( \phi \)

AgNO₃

Emf:  \[ Ag \mid AgNO₃(C_1) \mid AgNO₃(C_2) \mid Ag \]
\[ C = 0.002 - 0.10: \gamma \]

Isopiestic vapor pressure:  \( m = 0.1 - 13.5: \phi \) and \( \gamma \)
AgNO₃ (continued)

   Conductometric method: c = 0.00 - 0.00628: Diffusion coefficients

   Vapor pressure: m = 1.0 - 14.0: φ

NH₄Cl

   Vapor pressure: m = 0.1 - 7.38 (saturated): γ

   Isopiestic vapor pressure: m = 0.1 - 7.390 (saturated): γ and φ

   Isopiestic vapor pressure: m = 5.0 - 7.42: φ and γ

NH₄NO₃

   Isopiestic vapor pressure: m = 0.1 - 25.954 (saturated): γ and φ

NH₄ClO₄

   Isopiestic vapor pressure: m = 0.1 - 2.1: φ and γ

NaCNS

   Isopiestic vapor pressure: m = 0.1 - 4.0: φ and γ
NaCNS (continued)


Note: \( t = 25 \pm 1.0 \, ^\circ C \)

Isopiestic vapor pressure: \( m = 1.0 - 18.0: \gamma; (1-\phi) \)

Salt used without purification

KCNS


Vapor pressure: \( m = 0.00 - 10.0 \)


Isopiestic vapor pressure: \( m = 0.1 - 5.0: \phi \) and \( \gamma \)

\( \text{NaH}_2\text{PO}_4 \)


Isopiestic vapor pressure: \( m = 0.1 - 6.5: \phi \) and \( \gamma \)


Isopiestic vapor pressure: \( m = 0.1 - 1.3: 1 + \log \gamma \)

\( \text{KH}_2\text{PO}_4 \)


Isopiestic vapor pressure: \( m = 0.1 - 1.8: \phi \) and \( \gamma \)


Isopiestic vapor pressure: \( m = 0.1 - 1.3: \phi \)

\( \text{NaH}_2\text{AsO}_4 \)


Isopiestic vapor pressure: \( m = 0.1 - 1.3: \phi \)
KH₂AsO₄


Isopiestic vapor pressure: \( m = 0.1 - 1.3: \phi \)

<table>
<thead>
<tr>
<th>( m )</th>
<th>( \phi )</th>
<th>( \gamma )</th>
<th>( m )</th>
<th>( \phi )</th>
<th>( \gamma )</th>
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<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>0.002</td>
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<td>0.901</td>
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<td>0.575</td>
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<td></td>
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</table>

\[
\beta_m = 1.30 \\
\beta = -0.0252 \\
\phi^* = 0.0019 \\
\gamma^* = 0.0013
\]
TABLE 2 - Osmotic coefficients and mean activity coefficients of KF at 25 °C

Based on data in references 3,4]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
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<td>0.988</td>
<td>0.965</td>
<td>0.09</td>
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<td>0.644</td>
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<td>1.4</td>
<td>0.952</td>
<td>0.645</td>
</tr>
<tr>
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<td>1.6</td>
<td>0.953</td>
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<td>0.773</td>
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<td></td>
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<td></td>
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</tbody>
</table>

\[ B^* = 1.30 \]
\[ \beta = 0.0266 \]
\[ C = 0.00532 \]
\[ D = -0.000286 \]
\[ E = 0.00000376 \]
\[ s_\phi = 0.0035 \]
\[ s_\gamma = 0.0079 \]
TABLE 3 - Osmotic coefficients and mean activity coefficients of RbF at 25 °C

[Based on data in reference 5]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
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<td>0.001</td>
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<td>1.016</td>
<td>0.708</td>
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<tr>
<td>0.40</td>
<td>0.925</td>
<td>0.692</td>
<td>2.5</td>
<td>1.040</td>
<td>0.731</td>
</tr>
<tr>
<td>0.50</td>
<td>0.929</td>
<td>0.683</td>
<td>3.0</td>
<td>1.061</td>
<td>0.752</td>
</tr>
<tr>
<td>0.60</td>
<td>0.934</td>
<td>0.678</td>
<td>3.5</td>
<td>1.076</td>
<td>0.773</td>
</tr>
</tbody>
</table>

\[ \frac{B_m^*}{B_m} = 1.10 \]

\[ \beta = 0.0789 \]

\[ C = -0.00615 \]

\[ s_\phi = 0.00815 \]

\[ s_\gamma = 0.00590 \]
TABLE 4 - Osmotic coefficients and mean activity coefficients of CsF at 25 °C

[Based on data in reference 6]

<table>
<thead>
<tr>
<th>m</th>
<th>( \phi )</th>
<th>( \gamma )</th>
<th>m</th>
<th>( \phi )</th>
<th>( \gamma )</th>
</tr>
</thead>
<tbody>
<tr>
<td>.001</td>
<td>.988</td>
<td>.965</td>
<td>0.70</td>
<td>.959</td>
<td>.704</td>
</tr>
<tr>
<td>.002</td>
<td>.984</td>
<td>.952</td>
<td>.8</td>
<td>.967</td>
<td>.706</td>
</tr>
<tr>
<td>.005</td>
<td>.976</td>
<td>.927</td>
<td>.9</td>
<td>.976</td>
<td>.710</td>
</tr>
<tr>
<td>.01</td>
<td>.968</td>
<td>.902</td>
<td>1.0</td>
<td>.985</td>
<td>.715</td>
</tr>
<tr>
<td>.02</td>
<td>.958</td>
<td>.870</td>
<td>1.2</td>
<td>1.003</td>
<td>.727</td>
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<td>.05</td>
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<td>.820</td>
<td>1.4</td>
<td>1.021</td>
<td>.742</td>
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<td>.934</td>
<td>.779</td>
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<td>1.040</td>
<td>.758</td>
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<tr>
<td>.2</td>
<td>.929</td>
<td>.739</td>
<td>1.8</td>
<td>1.058</td>
<td>.777</td>
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<tr>
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<td>.720</td>
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<td>1.075</td>
<td>.796</td>
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<td>.4</td>
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<td>.709</td>
<td>2.5</td>
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<td>.5</td>
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<td>1.159</td>
<td>.908</td>
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<tr>
<td>.6</td>
<td>.951</td>
<td>.703</td>
<td>3.5</td>
<td>1.197</td>
<td>.970</td>
</tr>
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\[ B_m^* = 1.164 \]
\[ \beta = 0.0938 \]
\[ s_\phi = 0.0098 \]
\[ s_\gamma = 0.0068 \]
TABLE 5 - Osmotic coefficients and mean activity coefficients of NaClO₃ at 25 °C

[Based on data in reference 7]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>0.80</td>
<td>0.889</td>
<td>0.610</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.952</td>
<td>0.90</td>
<td>0.888</td>
<td>0.601</td>
</tr>
<tr>
<td>0.005</td>
<td>0.976</td>
<td>0.927</td>
<td>1.0</td>
<td>0.887</td>
<td>0.594</td>
</tr>
<tr>
<td>0.01</td>
<td>0.968</td>
<td>0.902</td>
<td>1.2</td>
<td>0.886</td>
<td>0.581</td>
</tr>
<tr>
<td>0.02</td>
<td>0.957</td>
<td>0.870</td>
<td>1.4</td>
<td>0.886</td>
<td>0.571</td>
</tr>
<tr>
<td>0.05</td>
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<td>0.817</td>
<td>1.6</td>
<td>0.886</td>
<td>0.562</td>
</tr>
<tr>
<td>0.10</td>
<td>0.927</td>
<td>0.769</td>
<td>1.8</td>
<td>0.886</td>
<td>0.554</td>
</tr>
<tr>
<td>0.20</td>
<td>0.913</td>
<td>0.717</td>
<td>2.0</td>
<td>0.886</td>
<td>0.548</td>
</tr>
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<td>0.30</td>
<td>0.905</td>
<td>0.686</td>
<td>2.5</td>
<td>0.887</td>
<td>0.535</td>
</tr>
<tr>
<td>0.40</td>
<td>0.900</td>
<td>0.663</td>
<td>3.0</td>
<td>0.886</td>
<td>0.524</td>
</tr>
<tr>
<td>0.50</td>
<td>0.896</td>
<td>0.646</td>
<td>3.5</td>
<td>0.885</td>
<td>0.514</td>
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<tr>
<td>0.60</td>
<td>0.893</td>
<td>0.632</td>
<td>4.0</td>
<td>0.882</td>
<td>0.504</td>
</tr>
<tr>
<td>0.70</td>
<td>0.891</td>
<td>0.620</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ B_m^{*} = 1.40 \]
\[ \beta = -0.0209 \]
\[ C = 0.00950 \]
\[ s_\phi = 0.00819 \]
\[ s_\gamma = 0.00546 \]
TABLE 6 - Osmotic coefficients and mean activity coefficients of KClO₃ at 25 °C

[Based on data in reference 8]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.951</td>
</tr>
<tr>
<td>0.005</td>
<td>0.975</td>
<td>0.926</td>
</tr>
<tr>
<td>0.01</td>
<td>0.966</td>
<td>0.899</td>
</tr>
<tr>
<td>0.02</td>
<td>0.955</td>
<td>0.865</td>
</tr>
<tr>
<td>0.05</td>
<td>0.934</td>
<td>0.806</td>
</tr>
<tr>
<td>0.10</td>
<td>0.914</td>
<td>0.749</td>
</tr>
<tr>
<td>0.20</td>
<td>0.886</td>
<td>0.680</td>
</tr>
<tr>
<td>0.30</td>
<td>0.865</td>
<td>0.634</td>
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<tr>
<td>0.40</td>
<td>0.848</td>
<td>0.598</td>
</tr>
<tr>
<td>0.50</td>
<td>0.833</td>
<td>0.568</td>
</tr>
<tr>
<td>0.60</td>
<td>0.820</td>
<td>0.543</td>
</tr>
<tr>
<td>0.70</td>
<td>0.808</td>
<td>0.522</td>
</tr>
</tbody>
</table>

\[ B^{*}_{m} = 1.50 \]
\[ \beta = -0.162 \]

\[ s_\phi = 0.00310 \]
\[ s_\gamma = 0.00198 \]
TABLE 7 - Osmotic coefficients and mean activity coefficients of NaBrO₃ at 25 °C

[Based on data in reference 9]

<table>
<thead>
<tr>
<th>m</th>
<th>Φ</th>
<th>γ</th>
<th>m</th>
<th>Φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>0.60</td>
<td>0.855</td>
<td>0.584</td>
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<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.951</td>
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<td>0.567</td>
</tr>
<tr>
<td>0.005</td>
<td>0.976</td>
<td>0.926</td>
<td>0.80</td>
<td>0.843</td>
<td>0.552</td>
</tr>
<tr>
<td>0.01</td>
<td>0.967</td>
<td>0.901</td>
<td>0.90</td>
<td>0.838</td>
<td>0.539</td>
</tr>
<tr>
<td>0.02</td>
<td>0.956</td>
<td>0.868</td>
<td>1.0</td>
<td>0.833</td>
<td>0.528</td>
</tr>
<tr>
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<td>0.811</td>
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<td>0.826</td>
<td>0.508</td>
</tr>
<tr>
<td>0.10</td>
<td>0.920</td>
<td>0.759</td>
<td>1.4</td>
<td>0.820</td>
<td>0.491</td>
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<td>0.898</td>
<td>0.698</td>
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<td>0.813</td>
<td>0.476</td>
</tr>
<tr>
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<td>0.658</td>
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<td>0.807</td>
<td>0.463</td>
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<td>0.872</td>
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<td>0.799</td>
<td>0.450</td>
</tr>
<tr>
<td>0.50</td>
<td>0.863</td>
<td>0.604</td>
<td>2.5</td>
<td>0.768</td>
<td>0.416</td>
</tr>
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\[ B_m^* = 1.50 \]
\[ \beta = -0.106 \]
\[ C = 0.0414 \]

\[ s_\Phi = 0.00680 \]
\[ s_\gamma = 0.00315 \]
TABLE 8 - Osmotic coefficients and mean activity coefficients of KBrO₃ at 25 °C

[Based on data in reference 10]

<table>
<thead>
<tr>
<th>m</th>
<th>( \phi )</th>
<th>( \gamma )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
</tr>
<tr>
<td>.002</td>
<td>.983</td>
<td>.951</td>
</tr>
<tr>
<td>.005</td>
<td>.974</td>
<td>.925</td>
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<tr>
<td>.01</td>
<td>.965</td>
<td>.898</td>
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<tr>
<td>.02</td>
<td>.953</td>
<td>.863</td>
</tr>
<tr>
<td>.05</td>
<td>.932</td>
<td>.802</td>
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<tr>
<td>.10</td>
<td>.910</td>
<td>.744</td>
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<tr>
<td>.20</td>
<td>.881</td>
<td>.672</td>
</tr>
<tr>
<td>.30</td>
<td>.857</td>
<td>.623</td>
</tr>
<tr>
<td>.40</td>
<td>.836</td>
<td>.584</td>
</tr>
<tr>
<td>.50</td>
<td>.817</td>
<td>.550</td>
</tr>
</tbody>
</table>

\[ B^*_m = 1.30 \]

\[ s_\phi = .00076 \]

\[ s_\gamma = .00327 \]
TABLE 9 - Osmotic coefficients and mean activity coefficients of HClO₄ at 25 °C

[Based on data in references 11-14]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.989</td>
<td>0.966</td>
<td>2.0</td>
<td>1.209</td>
<td>1.055</td>
</tr>
<tr>
<td>0.002</td>
<td>0.985</td>
<td>0.953</td>
<td>2.5</td>
<td>1.303</td>
<td>1.226</td>
</tr>
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<td>0.977</td>
<td>0.929</td>
<td>3.0</td>
<td>1.403</td>
<td>1.445</td>
</tr>
<tr>
<td>0.01</td>
<td>0.970</td>
<td>0.906</td>
<td>3.5</td>
<td>1.509</td>
<td>1.724</td>
</tr>
<tr>
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<td>0.878</td>
<td>4.0</td>
<td>1.621</td>
<td>2.078</td>
</tr>
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<td>0.836</td>
<td>4.5</td>
<td>1.737</td>
<td>2.527</td>
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<td>1.857</td>
<td>3.098</td>
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<td>1.98</td>
<td>3.83</td>
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<tr>
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<td>0.957</td>
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<td>6.0</td>
<td>2.11</td>
<td>4.75</td>
</tr>
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<td>0.967</td>
<td>0.765</td>
<td>7.0</td>
<td>2.37</td>
<td>7.45</td>
</tr>
<tr>
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<td>0.769</td>
<td>8.0</td>
<td>2.63</td>
<td>11.86</td>
</tr>
<tr>
<td>0.60</td>
<td>0.990</td>
<td>0.776</td>
<td>9.0</td>
<td>2.90</td>
<td>19.07</td>
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<tr>
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<td>3.17</td>
<td>30.8</td>
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<tr>
<td>0.80</td>
<td>1.016</td>
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<td>11.0</td>
<td>3.43</td>
<td>49.9</td>
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<tr>
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<td>80.6</td>
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<tr>
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<td>129.</td>
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<td>205.</td>
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<tr>
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<tr>
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\[ B_m^* = 1.70 \]
\[ E = 0.000000728 \]
\[ \beta = 0.0938 \]
\[ s_\phi = 0.00263 \]
\[ C = 0.0131 \]
\[ s_\gamma = 0.475 \]
\[ D = -0.000580 \]
TABLE 10 - Osmotic coefficients and mean activity coefficients of LiClO$_4$ at 25 °C

[Based on data in references 15,16]

<table>
<thead>
<tr>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
</tr>
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<tbody>
<tr>
<td>0.001</td>
<td>0.989</td>
<td>0.966</td>
<td>0.80</td>
<td>1.041</td>
<td>0.850</td>
</tr>
<tr>
<td>0.002</td>
<td>0.985</td>
<td>0.953</td>
<td>0.90</td>
<td>1.057</td>
<td>0.868</td>
</tr>
<tr>
<td>0.005</td>
<td>0.978</td>
<td>0.931</td>
<td>1.0</td>
<td>1.072</td>
<td>0.888</td>
</tr>
<tr>
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<td>0.908</td>
<td>1.2</td>
<td>1.104</td>
<td>0.932</td>
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<td>0.02</td>
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<td>0.882</td>
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<td>1.137</td>
<td>0.981</td>
</tr>
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<td>0.956</td>
<td>0.843</td>
<td>1.6</td>
<td>1.171</td>
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<td>1.095</td>
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<td>2.0</td>
<td>1.239</td>
<td>1.160</td>
</tr>
<tr>
<td>0.30</td>
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<td>2.5</td>
<td>1.327</td>
<td>1.349</td>
</tr>
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<td>0.40</td>
<td>0.983</td>
<td>0.797</td>
<td>3.0</td>
<td>1.417</td>
<td>1.580</td>
</tr>
<tr>
<td>0.50</td>
<td>0.997</td>
<td>0.806</td>
<td>3.5</td>
<td>1.509</td>
<td>1.859</td>
</tr>
<tr>
<td>0.60</td>
<td>1.011</td>
<td>0.818</td>
<td>4.0</td>
<td>1.601</td>
<td>2.195</td>
</tr>
<tr>
<td>0.70</td>
<td>1.026</td>
<td>0.833</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$B_m^* = 1.90$
$\beta = 0.117$
$C = 0.00753$
$D = -0.000594$

$s\phi = 0.00219$
$s\gamma = 0.00452$
<table>
<thead>
<tr>
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<th>( \phi )</th>
<th>( \gamma )</th>
<th>( m )</th>
<th>( \phi )</th>
<th>( \gamma )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>1.0</td>
<td>0.913</td>
<td>0.630</td>
</tr>
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<td>0.002</td>
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<td>0.952</td>
<td>1.2</td>
<td>0.916</td>
<td>0.622</td>
</tr>
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<td>1.4</td>
<td>0.920</td>
<td>0.616</td>
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<td>1.6</td>
<td>0.924</td>
<td>0.612</td>
</tr>
<tr>
<td>0.02</td>
<td>0.959</td>
<td>0.872</td>
<td>1.8</td>
<td>0.929</td>
<td>0.610</td>
</tr>
<tr>
<td>0.05</td>
<td>0.943</td>
<td>0.821</td>
<td>2.0</td>
<td>0.934</td>
<td>0.608</td>
</tr>
<tr>
<td>0.10</td>
<td>0.931</td>
<td>0.777</td>
<td>2.5</td>
<td>0.947</td>
<td>0.608</td>
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<td>0.20</td>
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<td>0.729</td>
<td>3.0</td>
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<td>0.30</td>
<td>0.915</td>
<td>0.702</td>
<td>3.5</td>
<td>0.976</td>
<td>0.618</td>
</tr>
<tr>
<td>0.40</td>
<td>0.912</td>
<td>0.683</td>
<td>4.0</td>
<td>0.991</td>
<td>0.626</td>
</tr>
<tr>
<td>0.50</td>
<td>0.911</td>
<td>0.668</td>
<td>4.5</td>
<td>1.007</td>
<td>0.636</td>
</tr>
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<td>0.910</td>
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<td>5.0</td>
<td>1.024</td>
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<td>1.042</td>
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<td>6.0</td>
<td>1.063</td>
<td>0.679</td>
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<tr>
<td>0.90</td>
<td>0.912</td>
<td>0.635</td>
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</tr>
</tbody>
</table>

\( B_m^* = 1.50 \)
\( \beta = -0.00300 \)
\( C = 0.00748 \)
\( D = -0.00120 \)
\( E = 0.0000826 \)
\( s_\phi = 0.00116 \)
\( s_\gamma = 0.00098 \)
TABLE 12 - Osmotic coefficients and mean activity coefficients of TlClO$_4$ at 25 °C

[Based on data in references 20]

<table>
<thead>
<tr>
<th>$m$</th>
<th>$\phi$</th>
<th>$\gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
</tr>
<tr>
<td>0.002</td>
<td>0.983</td>
<td>0.950</td>
</tr>
<tr>
<td>0.005</td>
<td>0.974</td>
<td>0.923</td>
</tr>
<tr>
<td>0.01</td>
<td>0.964</td>
<td>0.895</td>
</tr>
<tr>
<td>0.02</td>
<td>0.950</td>
<td>0.857</td>
</tr>
<tr>
<td>0.05</td>
<td>0.926</td>
<td>0.791</td>
</tr>
<tr>
<td>0.10</td>
<td>0.900</td>
<td>0.727</td>
</tr>
<tr>
<td>0.20</td>
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<td>0.650</td>
</tr>
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<td>0.30</td>
<td>0.843</td>
<td>0.598</td>
</tr>
<tr>
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<td>0.822</td>
<td>0.558</td>
</tr>
<tr>
<td>0.50</td>
<td>0.804</td>
<td>0.526</td>
</tr>
</tbody>
</table>

$B^*_m = 0.825$

$s_\phi = 0.00113$

$s_\gamma = 0.0026$
TABLE 13 - Osmotic coefficients and mean activity coefficients of LiOH at 25 °C

[Based on data in references 21,22]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>.001</td>
<td>0.988</td>
<td>0.964</td>
<td>.80</td>
<td>0.861</td>
<td>0.540</td>
</tr>
<tr>
<td>.002</td>
<td>0.983</td>
<td>0.950</td>
<td>.90</td>
<td>0.863</td>
<td>0.532</td>
</tr>
<tr>
<td>.005</td>
<td>0.974</td>
<td>0.924</td>
<td>1.0</td>
<td>0.866</td>
<td>0.526</td>
</tr>
<tr>
<td>.01</td>
<td>0.964</td>
<td>0.895</td>
<td>1.2</td>
<td>0.871</td>
<td>0.517</td>
</tr>
<tr>
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<td>0.951</td>
<td>0.859</td>
<td>1.4</td>
<td>0.875</td>
<td>0.508</td>
</tr>
<tr>
<td>.05</td>
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<td>0.794</td>
<td>1.6</td>
<td>0.876</td>
<td>0.501</td>
</tr>
<tr>
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<td>0.906</td>
<td>0.734</td>
<td>1.8</td>
<td>0.876</td>
<td>0.493</td>
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<td>.20</td>
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<td>0.665</td>
<td>2.0</td>
<td>0.874</td>
<td>0.486</td>
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<tr>
<td>.30</td>
<td>0.868</td>
<td>0.624</td>
<td>2.5</td>
<td>0.869</td>
<td>0.470</td>
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<tr>
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<td>0.859</td>
<td>0.549</td>
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<td></td>
</tr>
</tbody>
</table>

$B_m = 0.800$
$\beta = -0.0694$
$C = 0.138$
$D = -0.0831$
$E = 0.0210$
$F = -0.00191$
$s\phi = 0.0934$
$s\gamma = 0.0354$
TABLE 14 - Osmotic coefficients and mean activity coefficients of NaOH at 25 °C

([Based on data in references 23-30])

<table>
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<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>1.6</td>
<td>0.991</td>
<td>0.690</td>
<td>13.0</td>
<td>2.38</td>
<td>6.51</td>
</tr>
<tr>
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<td>.984</td>
<td>.952</td>
<td>1.8</td>
<td>1.005</td>
<td>.700</td>
<td>14.0</td>
<td>2.48</td>
<td>8.03</td>
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<tr>
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<td>.976</td>
<td>.927</td>
<td>2.0</td>
<td>1.020</td>
<td>.711</td>
<td>15.0</td>
<td>2.57</td>
<td>9.74</td>
</tr>
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<td>.968</td>
<td>.902</td>
<td>2.5</td>
<td>1.060</td>
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<td>16.0</td>
<td>2.64</td>
<td>11.6</td>
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<td>.871</td>
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<td>1.103</td>
<td>.792</td>
<td>17.0</td>
<td>2.70</td>
<td>13.6</td>
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<td>.943</td>
<td>.820</td>
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<td>1.151</td>
<td>.846</td>
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<td>2.74</td>
<td>15.6</td>
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<td>.777</td>
<td>4.0</td>
<td>1.202</td>
<td>.912</td>
<td>19.0</td>
<td>2.77</td>
<td>17.6</td>
</tr>
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<td>.733</td>
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<td>1.256</td>
<td>.989</td>
<td>20.0</td>
<td>2.78</td>
<td>19.6</td>
</tr>
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<td>.923</td>
<td>.710</td>
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<td>1.079</td>
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<td>.696</td>
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<td>1.38</td>
<td>1.19</td>
<td>22.0</td>
<td>2.78</td>
<td>23.1</td>
</tr>
<tr>
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<td>1.62</td>
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<td>2.75</td>
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<tr>
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<td>1.71</td>
<td>2.03</td>
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<td>2.74</td>
<td>28.0</td>
</tr>
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<td>.674</td>
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<td>1.86</td>
<td>2.56</td>
<td>26.0</td>
<td>2.73</td>
<td>29.7</td>
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<tr>
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<td>.673</td>
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<td>2.00</td>
<td>3.25</td>
<td>27.0</td>
<td>2.73</td>
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<td>.673</td>
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<td>2.13</td>
<td>4.13</td>
<td>28.0</td>
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<td>.676</td>
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<td>5.21</td>
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<td>2.72</td>
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</tbody>
</table>

B = 1.30
β = 0.0484
C = 0.00125
D = 0.000714
E = -0.0000687

F = 0.00000216
G = -0.0000000230
s₁ = 0.0164
s₂ = 0.527
- 27 -

**TABLE 15 - Osmotic coefficients and mean activity coefficients of KOH at 25 °C**

[Based on data in references 31-35]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
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<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>1.0</td>
<td>0.999</td>
<td>0.733</td>
<td>7.0</td>
<td>1.82</td>
<td>2.82</td>
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<td>0.984</td>
<td>0.952</td>
<td>1.2</td>
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<td>0.751</td>
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<td>1.045</td>
<td>0.773</td>
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<td>4.73</td>
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<td>0.968</td>
<td>0.902</td>
<td>1.6</td>
<td>1.069</td>
<td>0.798</td>
<td>10.0</td>
<td>2.23</td>
<td>6.10</td>
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<td>0.958</td>
<td>0.871</td>
<td>1.8</td>
<td>1.094</td>
<td>0.826</td>
<td>11.0</td>
<td>2.35</td>
<td>7.83</td>
</tr>
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<td>0.944</td>
<td>0.822</td>
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<td>12.0</td>
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<td>1.053</td>
<td>14.0</td>
<td>2.69</td>
<td>15.8</td>
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<td>0.30</td>
<td>0.934</td>
<td>0.724</td>
<td>3.5</td>
<td>1.321</td>
<td>1.18</td>
<td>15.0</td>
<td>2.78</td>
<td>19.5</td>
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<tr>
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<td>0.712</td>
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<td>1.50</td>
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<td>2.94</td>
<td>28.8</td>
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<td></td>
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</tbody>
</table>

\[ B_\text{m}^* = 1.20 \]

\[ \beta = 0.0933 \]

\[ \gamma = 0.00405 \]

\[ D = -0.000250 \]

\[ E = 0.00000342 \]

\[ s_\phi = 0.0107 \]

\[ s_\gamma = 0.257 \]
TABLE 16 - Osmotic coefficients and mean activity coefficients of CsOH at 25 °C

[Based on data in reference 36]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>.001</td>
<td>.988</td>
<td>.965</td>
<td>.4</td>
<td>.955</td>
<td>.744</td>
</tr>
<tr>
<td>.002</td>
<td>.984</td>
<td>.952</td>
<td>.5</td>
<td>.964</td>
<td>.744</td>
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<tr>
<td>.005</td>
<td>.976</td>
<td>.928</td>
<td>.6</td>
<td>.974</td>
<td>.747</td>
</tr>
<tr>
<td>.01</td>
<td>.969</td>
<td>.904</td>
<td>.7</td>
<td>.984</td>
<td>.752</td>
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<td>.960</td>
<td>.875</td>
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<td>.3</td>
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<td>.748</td>
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<td></td>
</tr>
</tbody>
</table>

\[ B_m^* = 1.47 \]
\[ \beta = 0.0969 \]
\[ s_\gamma = 0.00658 \]
TABLE 17 - Osmotic coefficients and mean activity coefficients of HNO₃ at 25 °C

[Based on data in references 37-41]

<table>
<thead>
<tr>
<th>m</th>
<th>ϕ</th>
<th>γ</th>
<th>m</th>
<th>ϕ</th>
<th>γ</th>
<th>m</th>
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<td>0.965</td>
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<tr>
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<td>0.952</td>
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<td>0.928</td>
<td>1.8</td>
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<td>1.53</td>
<td>2.11</td>
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<td>0.969</td>
<td>0.904</td>
<td>2.0</td>
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<td>0.784</td>
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<td>0.867</td>
<td>17.0</td>
<td>1.55</td>
<td>2.41</td>
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<td>0.10</td>
<td>0.939</td>
<td>0.789</td>
<td>3.5</td>
<td>1.148</td>
<td>0.913</td>
<td>18.0</td>
<td>1.55</td>
<td>2.49</td>
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<tr>
<td>0.20</td>
<td>0.936</td>
<td>0.753</td>
<td>4.0</td>
<td>1.178</td>
<td>0.961</td>
<td>19.0</td>
<td>1.55</td>
<td>2.55</td>
</tr>
<tr>
<td>0.30</td>
<td>0.938</td>
<td>0.735</td>
<td>4.5</td>
<td>1.207</td>
<td>1.011</td>
<td>20.0</td>
<td>1.54</td>
<td>2.61</td>
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<tr>
<td>0.40</td>
<td>0.942</td>
<td>0.725</td>
<td>5.0</td>
<td>1.234</td>
<td>1.064</td>
<td>21.0</td>
<td>1.54</td>
<td>2.66</td>
</tr>
<tr>
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<td>0.947</td>
<td>0.720</td>
<td>5.5</td>
<td>1.26</td>
<td>1.12</td>
<td>22.0</td>
<td>1.52</td>
<td>2.70</td>
</tr>
<tr>
<td>0.60</td>
<td>0.954</td>
<td>0.718</td>
<td>6.0</td>
<td>1.29</td>
<td>1.17</td>
<td>23.0</td>
<td>1.51</td>
<td>2.73</td>
</tr>
<tr>
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<td>0.960</td>
<td>0.718</td>
<td>7.0</td>
<td>1.33</td>
<td>1.29</td>
<td>24.0</td>
<td>1.50</td>
<td>2.74</td>
</tr>
<tr>
<td>0.80</td>
<td>0.967</td>
<td>0.719</td>
<td>8.0</td>
<td>1.37</td>
<td>1.41</td>
<td>25.0</td>
<td>1.48</td>
<td>2.75</td>
</tr>
<tr>
<td>0.90</td>
<td>0.974</td>
<td>0.722</td>
<td>9.0</td>
<td>1.41</td>
<td>1.53</td>
<td>26.0</td>
<td>1.46</td>
<td>2.74</td>
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<td>0.725</td>
<td>10.0</td>
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<td>27.0</td>
<td>1.43</td>
<td>2.72</td>
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<td>1.2</td>
<td>0.995</td>
<td>0.734</td>
<td>11.0</td>
<td>1.47</td>
<td>1.77</td>
<td>28.0</td>
<td>1.41</td>
<td>2.70</td>
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</tbody>
</table>

\[
B_m = 1.50
\]
\[
\beta = 0.0665
\]
\[
C = -0.00180
\]
\[
D = 0.0000127
\]
\[
\sigma_\phi = 0.0142
\]
\[
\sigma_\gamma = 0.0324
\]
TABLE 18 - Osmotic coefficients and mean activity coefficients of LiNO₃ at 25 °C

[Based on data in references 42-46]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>1.0</td>
<td>0.997</td>
<td>0.743</td>
<td>7.0</td>
<td>1.49</td>
<td>1.72</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.952</td>
<td>1.2</td>
<td>1.014</td>
<td>0.758</td>
<td>8.0</td>
<td>1.55</td>
<td>1.96</td>
</tr>
<tr>
<td>0.005</td>
<td>0.976</td>
<td>0.928</td>
<td>1.4</td>
<td>1.033</td>
<td>0.775</td>
<td>9.0</td>
<td>1.61</td>
<td>2.22</td>
</tr>
<tr>
<td>0.01</td>
<td>0.969</td>
<td>0.904</td>
<td>1.6</td>
<td>1.052</td>
<td>0.794</td>
<td>10.0</td>
<td>1.66</td>
<td>2.50</td>
</tr>
<tr>
<td>0.02</td>
<td>0.960</td>
<td>0.874</td>
<td>1.8</td>
<td>1.070</td>
<td>0.815</td>
<td>11.0</td>
<td>1.70</td>
<td>2.79</td>
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<tr>
<td>0.05</td>
<td>0.947</td>
<td>0.827</td>
<td>2.0</td>
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<td>0.837</td>
<td>12.0</td>
<td>1.74</td>
<td>3.08</td>
</tr>
<tr>
<td>0.10</td>
<td>0.939</td>
<td>0.789</td>
<td>2.5</td>
<td>1.134</td>
<td>0.898</td>
<td>13.0</td>
<td>1.77</td>
<td>3.38</td>
</tr>
<tr>
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<td>0.936</td>
<td>0.753</td>
<td>3.0</td>
<td>1.178</td>
<td>0.966</td>
<td>14.0</td>
<td>1.80</td>
<td>3.68</td>
</tr>
<tr>
<td>0.30</td>
<td>0.940</td>
<td>0.736</td>
<td>3.5</td>
<td>1.222</td>
<td>1.039</td>
<td>15.0</td>
<td>1.81</td>
<td>3.96</td>
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<tr>
<td>0.40</td>
<td>0.946</td>
<td>0.729</td>
<td>4.0</td>
<td>1.263</td>
<td>1.119</td>
<td>16.0</td>
<td>1.82</td>
<td>4.22</td>
</tr>
<tr>
<td>0.50</td>
<td>0.953</td>
<td>0.726</td>
<td>4.5</td>
<td>1.304</td>
<td>1.205</td>
<td>17.0</td>
<td>1.83</td>
<td>4.46</td>
</tr>
<tr>
<td>0.60</td>
<td>0.961</td>
<td>0.726</td>
<td>5.0</td>
<td>1.34</td>
<td>1.30</td>
<td>18.0</td>
<td>1.83</td>
<td>4.67</td>
</tr>
<tr>
<td>0.70</td>
<td>0.970</td>
<td>0.728</td>
<td>5.5</td>
<td>1.38</td>
<td>1.39</td>
<td>19.0</td>
<td>1.82</td>
<td>4.84</td>
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<td>0.978</td>
<td>0.732</td>
<td>6.0</td>
<td>1.42</td>
<td>1.50</td>
<td>20.0</td>
<td>1.81</td>
<td>4.97</td>
</tr>
<tr>
<td>0.90</td>
<td>0.987</td>
<td>0.737</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

\[ B_m^* = 1.40 \]
\[ \beta = 0.0854 \]
\[ C = -0.00138 \]
\[ D = -0.0000216 \]
\[ E = 0.000000191 \]
\[ s_\phi = 0.0180 \]
\[ s_\gamma = 0.0625 \]
TABLE 19  - Osmotic coefficients and mean activity coefficients of NaNO$_3$ at 25 °C

[Based on data in references 47-51]

<table>
<thead>
<tr>
<th>$m$</th>
<th>$\phi$</th>
<th>$\gamma$</th>
<th>$m$</th>
<th>$\phi$</th>
<th>$\gamma$</th>
<th>$m$</th>
<th>$\phi$</th>
<th>$\gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>0.60</td>
<td>0.869</td>
<td>0.600</td>
<td>3.0</td>
<td>0.810</td>
<td>0.437</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.951</td>
<td>0.70</td>
<td>0.864</td>
<td>0.585</td>
<td>3.5</td>
<td>0.803</td>
<td>0.421</td>
</tr>
<tr>
<td>0.005</td>
<td>0.975</td>
<td>0.926</td>
<td>0.80</td>
<td>0.860</td>
<td>0.571</td>
<td>4.0</td>
<td>0.797</td>
<td>0.408</td>
</tr>
<tr>
<td>0.01</td>
<td>0.967</td>
<td>0.900</td>
<td>0.90</td>
<td>0.855</td>
<td>0.559</td>
<td>4.5</td>
<td>0.792</td>
<td>0.396</td>
</tr>
<tr>
<td>0.02</td>
<td>0.956</td>
<td>0.867</td>
<td>1.0</td>
<td>0.852</td>
<td>0.549</td>
<td>5.0</td>
<td>0.788</td>
<td>0.386</td>
</tr>
<tr>
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<td>0.938</td>
<td>0.811</td>
<td>1.2</td>
<td>0.845</td>
<td>0.530</td>
<td>5.5</td>
<td>0.787</td>
<td>0.378</td>
</tr>
<tr>
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<td>0.921</td>
<td>0.760</td>
<td>1.4</td>
<td>0.839</td>
<td>0.514</td>
<td>6.0</td>
<td>0.788</td>
<td>0.371</td>
</tr>
<tr>
<td>0.20</td>
<td>0.903</td>
<td>0.702</td>
<td>1.6</td>
<td>0.834</td>
<td>0.501</td>
<td>7.0</td>
<td>0.807</td>
<td>0.366</td>
</tr>
<tr>
<td>0.30</td>
<td>0.891</td>
<td>0.666</td>
<td>1.8</td>
<td>0.830</td>
<td>0.489</td>
<td>8.0</td>
<td>0.858</td>
<td>0.377</td>
</tr>
<tr>
<td>0.40</td>
<td>0.883</td>
<td>0.639</td>
<td>2.0</td>
<td>0.826</td>
<td>0.478</td>
<td>9.0</td>
<td>0.962</td>
<td>0.414</td>
</tr>
<tr>
<td>0.50</td>
<td>0.875</td>
<td>0.618</td>
<td>2.5</td>
<td>0.817</td>
<td>0.456</td>
<td>10.0</td>
<td>1.14</td>
<td>0.497</td>
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</table>

$B_m^* = 1.30$
$\beta = -0.0465$
$C = 0.00940$
$D = -0.00151$
$E = 0.000105$
$s_\phi = 0.0817$
$s_\gamma = 0.0339$
TABLE 20 - Osmotic coefficients and mean activity coefficients of KNO₃ at 25 °C

[Based on data in references 52-55]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
<td>0.70</td>
<td>0.791</td>
<td>0.498</td>
</tr>
<tr>
<td>0.002</td>
<td>0.983</td>
<td>0.951</td>
<td>0.80</td>
<td>0.778</td>
<td>0.477</td>
</tr>
<tr>
<td>0.005</td>
<td>0.975</td>
<td>0.924</td>
<td>0.90</td>
<td>0.766</td>
<td>0.459</td>
</tr>
<tr>
<td>0.01</td>
<td>0.965</td>
<td>0.897</td>
<td>1.0</td>
<td>0.754</td>
<td>0.442</td>
</tr>
<tr>
<td>0.02</td>
<td>0.953</td>
<td>0.861</td>
<td>1.2</td>
<td>0.733</td>
<td>0.413</td>
</tr>
<tr>
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<td>0.930</td>
<td>0.798</td>
<td>1.4</td>
<td>0.714</td>
<td>0.389</td>
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<tr>
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<td>0.907</td>
<td>0.737</td>
<td>1.6</td>
<td>0.697</td>
<td>0.367</td>
</tr>
<tr>
<td>0.20</td>
<td>0.877</td>
<td>0.664</td>
<td>1.8</td>
<td>0.681</td>
<td>0.348</td>
</tr>
<tr>
<td>0.30</td>
<td>0.855</td>
<td>0.615</td>
<td>2.0</td>
<td>0.666</td>
<td>0.332</td>
</tr>
<tr>
<td>0.40</td>
<td>0.836</td>
<td>0.578</td>
<td>2.5</td>
<td>0.636</td>
<td>0.298</td>
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<tr>
<td>0.50</td>
<td>0.819</td>
<td>0.547</td>
<td>3.0</td>
<td>0.612</td>
<td>0.271</td>
</tr>
<tr>
<td>0.60</td>
<td>0.804</td>
<td>0.520</td>
<td>3.5</td>
<td>0.595</td>
<td>0.251</td>
</tr>
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\[ B_m^* = 1.10 \]
\[ \beta = -0.126 \]
\[ c = 0.0165 \]
\[ s_\phi = 0.0058 \]
\[ s_\gamma = 0.0019 \]
TABLE 21 - Osmotic coefficents and mean activity coefficents of RbNO$_3$ at 25 °C

[Based on data in reference 56]

<table>
<thead>
<tr>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
<td>0.80</td>
<td>0.769</td>
<td>0.466</td>
</tr>
<tr>
<td>0.002</td>
<td>0.983</td>
<td>0.950</td>
<td>0.90</td>
<td>0.756</td>
<td>0.447</td>
</tr>
<tr>
<td>0.005</td>
<td>0.974</td>
<td>0.924</td>
<td>1.0</td>
<td>0.744</td>
<td>0.430</td>
</tr>
<tr>
<td>0.01</td>
<td>0.965</td>
<td>0.896</td>
<td>1.2</td>
<td>0.722</td>
<td>0.401</td>
</tr>
<tr>
<td>0.02</td>
<td>0.952</td>
<td>0.859</td>
<td>1.4</td>
<td>0.702</td>
<td>0.376</td>
</tr>
<tr>
<td>0.05</td>
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<td>0.354</td>
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<tr>
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<td>0.904</td>
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<td>0.319</td>
</tr>
<tr>
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<td>0.849</td>
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<td>0.284</td>
</tr>
<tr>
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<td>0.829</td>
<td>0.568</td>
<td>3.0</td>
<td>0.593</td>
<td>0.258</td>
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<tr>
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<td>0.812</td>
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<td>3.5</td>
<td>0.572</td>
<td>0.237</td>
</tr>
<tr>
<td>0.60</td>
<td>0.796</td>
<td>0.510</td>
<td>4.0</td>
<td>0.558</td>
<td>0.220</td>
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<tr>
<td>0.70</td>
<td>0.782</td>
<td>0.486</td>
<td>4.5</td>
<td>0.549</td>
<td>0.207</td>
</tr>
</tbody>
</table>

$\frac{R_m}{m} = 1.00$

$\beta = -0.125$

$C = 0.0159$

$\delta \phi = 0.0100$

$\delta \gamma = 0.0026$
TABLE 22 - Osmotic coefficients and mean activity coefficients of CsNO₃ at 25 °C

[Based on data in reference 57]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
<td>0.40</td>
<td>0.822</td>
<td>0.562</td>
</tr>
<tr>
<td>.002</td>
<td>.983</td>
<td>.951</td>
<td>.50</td>
<td>.803</td>
<td>.529</td>
</tr>
<tr>
<td>.005</td>
<td>.974</td>
<td>.924</td>
<td>.60</td>
<td>.786</td>
<td>.501</td>
</tr>
<tr>
<td>.01</td>
<td>.965</td>
<td>.897</td>
<td>.70</td>
<td>.771</td>
<td>.477</td>
</tr>
<tr>
<td>.02</td>
<td>.952</td>
<td>.860</td>
<td>.80</td>
<td>.758</td>
<td>.456</td>
</tr>
<tr>
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<td>.929</td>
<td>.796</td>
<td>.90</td>
<td>.745</td>
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<td>.421</td>
</tr>
<tr>
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<td>.870</td>
<td>.656</td>
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<td>.394</td>
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<td>.844</td>
<td>.603</td>
<td>1.4</td>
<td>.704</td>
<td>.372</td>
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</table>

\[ B_m^* = 1.20 \]
\[ \beta = -0.182 \]
\[ C = 0.0397 \]
\[ s_\phi = 0.0036 \]
\[ s_\gamma = 0.0016 \]
TABLE 23 - Osmotic coefficients and mean activity coefficients of AgNO₃ at 25 °C

[Based on data in references 58-61]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
<td>0.70</td>
<td>0.783</td>
<td>0.486</td>
<td>4.0</td>
<td>0.521</td>
<td>0.210</td>
</tr>
<tr>
<td>.002</td>
<td>0.983</td>
<td>0.950</td>
<td>.80</td>
<td>.770</td>
<td>.465</td>
<td>4.5</td>
<td>.499</td>
<td>.194</td>
</tr>
<tr>
<td>.005</td>
<td>0.974</td>
<td>0.924</td>
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<td>.576</td>
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<td>12.0</td>
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<tr>
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<td>.229</td>
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$C = 0.00755$
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$s_γ = 0.00155$
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<th>γ</th>
<th>m</th>
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<th>γ</th>
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<td>0.591</td>
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<td>0.899</td>
<td>0.584</td>
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<td>0.902</td>
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<tr>
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<td>0.902</td>
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<td>0.945</td>
<td>0.561</td>
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<tr>
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<td>0.896</td>
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<tr>
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<td>0.562</td>
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<tr>
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<td>0.608</td>
<td>7.0</td>
<td>0.989</td>
<td>0.573</td>
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$\phi = 0.00667$

$\gamma = 0.00387$
### TABLE 25 - Osmotic coefficients and mean activity coefficients of NH₄NO₃ at 25 °C

[Based on data in reference 65]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
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<td>0.964</td>
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<td>0.631</td>
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<td>0.983</td>
<td>0.951</td>
<td>1.4</td>
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<td>10.0</td>
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<td>0.610</td>
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<td>0.431</td>
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<td>0.600</td>
<td>0.202</td>
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<tr>
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<td>0.954</td>
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<td>0.591</td>
<td>0.194</td>
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<tr>
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<td>0.802</td>
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<td>0.389</td>
<td>14.0</td>
<td>0.581</td>
<td>0.186</td>
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<tr>
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<td>0.572</td>
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<tr>
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<td>16.0</td>
<td>0.562</td>
<td>0.173</td>
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<tr>
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<td>0.640</td>
<td>4.0</td>
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<td>0.553</td>
<td>0.167</td>
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<td>24.0</td>
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<td>0.139</td>
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\[ B_m^* = 1.00 \]

\[ B = -0.0450 \]

\[ C = 0.00286 \]

\[ D = -0.000124 \]

\[ E = 0.00000215 \]

\[ s_\phi = 0.0196 \]

\[ s_\gamma = 0.00313 \]
TABLE 26 - Osmotic coefficients and mean activity coefficients of NH₄ClO₄ at 25 °C

[Based on data in reference 66]

<table>
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<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
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<tbody>
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<td>0.964</td>
<td>0.60</td>
<td>0.823</td>
<td>0.537</td>
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<td>0.813</td>
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<tr>
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<td>0.80</td>
<td>0.805</td>
<td>0.500</td>
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<td>0.485</td>
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Bₘ* = 1.00
β = -0.0905
C = 0.0190
s_φ = .0131
s_γ = .00875
TABLE 27 - Osmotic coefficients and mean activity coefficients of NaCNS at 25 °C

[Based on data in references 67,68]

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<th>( \gamma )</th>
<th>m</th>
<th>( \phi )</th>
<th>( \gamma )</th>
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<th>( \phi )</th>
<th>( \gamma )</th>
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<td>0.90</td>
<td>0.962</td>
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<td>1.34</td>
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<td>0.984</td>
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<td>1.00</td>
<td>0.968</td>
<td>0.710</td>
<td>7.0</td>
<td>1.42</td>
<td>1.39</td>
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\[ \beta_m = 1.60 \]
\[ \beta = 0.0458 \]
\[ C = 0.00176 \]
\[ D = 0.0000986 \]
\[ E = -0.0000198 \]
\[ s_\phi = 0.07 \]
\[ s_\gamma = 0.180 \]
TABLE 28 - Osmotic coefficients and mean activity coefficients of KCNS at 25 °C

[Based on data in references 69,70]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
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<td>0.895</td>
<td>0.623</td>
<td>5.0</td>
<td>0.898</td>
<td>0.508</td>
</tr>
<tr>
<td>0.80</td>
<td>0.894</td>
<td>0.614</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ B_m^* = 1.30 \]
\[ \beta = -0.00291 \]
\[ C = 0.00302 \]
\[ s_\phi = 0.0105 \]
\[ s_\gamma = 0.00620 \]
TABLE 29 - Osmotic coefficients and mean activity coefficients of NaH$_2$PO$_4$ at 25 °C

[Based on data in references 71, 72]

<table>
<thead>
<tr>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>1.0</td>
<td>0.778</td>
<td>0.469</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.951</td>
<td>1.2</td>
<td>0.762</td>
<td>0.442</td>
</tr>
<tr>
<td>0.005</td>
<td>0.975</td>
<td>0.925</td>
<td>1.4</td>
<td>0.747</td>
<td>0.420</td>
</tr>
<tr>
<td>0.01</td>
<td>0.966</td>
<td>0.898</td>
<td>1.6</td>
<td>0.735</td>
<td>0.400</td>
</tr>
<tr>
<td>0.02</td>
<td>0.954</td>
<td>0.864</td>
<td>1.8</td>
<td>0.724</td>
<td>0.384</td>
</tr>
<tr>
<td>0.05</td>
<td>0.933</td>
<td>0.804</td>
<td>2.0</td>
<td>0.715</td>
<td>0.369</td>
</tr>
<tr>
<td>0.10</td>
<td>0.912</td>
<td>0.746</td>
<td>2.5</td>
<td>0.699</td>
<td>0.340</td>
</tr>
<tr>
<td>0.20</td>
<td>0.885</td>
<td>0.677</td>
<td>3.0</td>
<td>0.690</td>
<td>0.319</td>
</tr>
<tr>
<td>0.30</td>
<td>0.865</td>
<td>0.631</td>
<td>3.5</td>
<td>0.687</td>
<td>0.303</td>
</tr>
<tr>
<td>0.40</td>
<td>0.848</td>
<td>0.595</td>
<td>4.0</td>
<td>0.689</td>
<td>0.291</td>
</tr>
<tr>
<td>0.50</td>
<td>0.833</td>
<td>0.566</td>
<td>4.5</td>
<td>0.697</td>
<td>0.283</td>
</tr>
<tr>
<td>0.60</td>
<td>0.820</td>
<td>0.541</td>
<td>5.0</td>
<td>0.710</td>
<td>0.278</td>
</tr>
<tr>
<td>0.70</td>
<td>0.808</td>
<td>0.520</td>
<td>5.5</td>
<td>0.729</td>
<td>0.276</td>
</tr>
<tr>
<td>0.80</td>
<td>0.798</td>
<td>0.501</td>
<td>6.0</td>
<td>0.753</td>
<td>0.276</td>
</tr>
<tr>
<td>0.90</td>
<td>0.788</td>
<td>0.484</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$B_m^* = 1.30$

$\beta = -0.130$

$c = 0.0260$

$s_{\phi} = 0.0137$

$s_{\gamma} = 0.00429$
TABLE 30 - Osmotic coefficients and mean activity coefficients of KH₂PO₄ at 25 °C

[Based on data in references 73, 74]

<table>
<thead>
<tr>
<th>m</th>
<th>φ</th>
<th>γ</th>
<th>m</th>
<th>φ</th>
<th>γ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.964</td>
<td>0.50</td>
<td>0.807</td>
<td>0.536</td>
</tr>
<tr>
<td>.002</td>
<td>.983</td>
<td>.951</td>
<td>.60</td>
<td>.790</td>
<td>.508</td>
</tr>
<tr>
<td>.005</td>
<td>.975</td>
<td>.925</td>
<td>.70</td>
<td>.774</td>
<td>.483</td>
</tr>
<tr>
<td>.01</td>
<td>.965</td>
<td>.897</td>
<td>.80</td>
<td>.759</td>
<td>.461</td>
</tr>
<tr>
<td>.02</td>
<td>.953</td>
<td>.862</td>
<td>.90</td>
<td>.745</td>
<td>.442</td>
</tr>
<tr>
<td>.05</td>
<td>.930</td>
<td>.798</td>
<td>1.0</td>
<td>.732</td>
<td>.424</td>
</tr>
<tr>
<td>.10</td>
<td>.906</td>
<td>.737</td>
<td>1.2</td>
<td>.707</td>
<td>.393</td>
</tr>
<tr>
<td>.20</td>
<td>.873</td>
<td>.661</td>
<td>1.4</td>
<td>.683</td>
<td>.366</td>
</tr>
<tr>
<td>.30</td>
<td>.848</td>
<td>.609</td>
<td>1.6</td>
<td>.660</td>
<td>.342</td>
</tr>
<tr>
<td>.40</td>
<td>.826</td>
<td>.569</td>
<td>1.8</td>
<td>.638</td>
<td>.321</td>
</tr>
</tbody>
</table>

\[ B_m^* = 1.30 \]
\[ \beta = -0.187 \]
\[ C = 0.0498 \]
\[ s_\phi = 0.00936 \]
\[ s_\gamma = 0.00629 \]
TABLE 31 - Osmotic coefficients and mean activity coefficients of NaH$_2$AsO$_4$ at 25 °C

[Based on data in reference 75]

<table>
<thead>
<tr>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
<th>m</th>
<th>$\phi$</th>
<th>$\gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>0.40</td>
<td>0.876</td>
<td>0.638</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.952</td>
<td>0.50</td>
<td>0.864</td>
<td>0.613</td>
</tr>
<tr>
<td>0.005</td>
<td>0.976</td>
<td>0.927</td>
<td>0.60</td>
<td>0.853</td>
<td>0.590</td>
</tr>
<tr>
<td>0.01</td>
<td>0.968</td>
<td>0.902</td>
<td>0.70</td>
<td>0.842</td>
<td>0.570</td>
</tr>
<tr>
<td>0.02</td>
<td>0.957</td>
<td>0.870</td>
<td>0.80</td>
<td>0.831</td>
<td>0.552</td>
</tr>
<tr>
<td>0.05</td>
<td>0.940</td>
<td>0.816</td>
<td>0.90</td>
<td>0.820</td>
<td>0.535</td>
</tr>
<tr>
<td>0.10</td>
<td>0.924</td>
<td>0.766</td>
<td>1.0</td>
<td>0.810</td>
<td>0.519</td>
</tr>
<tr>
<td>0.20</td>
<td>0.904</td>
<td>0.707</td>
<td>1.2</td>
<td>0.788</td>
<td>0.490</td>
</tr>
<tr>
<td>0.30</td>
<td>0.889</td>
<td>0.668</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$B_m^* = 1.60$

$\beta = -0.0849$

$s_{\phi} = 0.00774$

$s_{\gamma} = 0.00416$
TABLE 32 - Osmotic coefficients and mean activity coefficients of KH₂AsO₄ at 25 °C

[Based on data in reference 76]

<table>
<thead>
<tr>
<th>m</th>
<th>( \phi )</th>
<th>( \gamma )</th>
<th>( m )</th>
<th>( \phi )</th>
<th>( \gamma )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
<td>0.988</td>
<td>0.965</td>
<td>0.40</td>
<td>0.849</td>
<td>0.601</td>
</tr>
<tr>
<td>0.002</td>
<td>0.984</td>
<td>0.951</td>
<td>0.50</td>
<td>0.833</td>
<td>0.571</td>
</tr>
<tr>
<td>0.005</td>
<td>0.975</td>
<td>0.926</td>
<td>0.60</td>
<td>0.819</td>
<td>0.545</td>
</tr>
<tr>
<td>0.01</td>
<td>0.966</td>
<td>0.899</td>
<td>0.70</td>
<td>0.807</td>
<td>0.523</td>
</tr>
<tr>
<td>0.02</td>
<td>0.955</td>
<td>0.865</td>
<td>0.80</td>
<td>0.796</td>
<td>0.504</td>
</tr>
<tr>
<td>0.05</td>
<td>0.935</td>
<td>0.807</td>
<td>0.90</td>
<td>0.787</td>
<td>0.487</td>
</tr>
<tr>
<td>0.10</td>
<td>0.915</td>
<td>0.752</td>
<td>1.00</td>
<td>0.772</td>
<td>0.472</td>
</tr>
<tr>
<td>0.20</td>
<td>0.889</td>
<td>0.684</td>
<td>1.20</td>
<td>0.754</td>
<td>0.442</td>
</tr>
<tr>
<td>0.30</td>
<td>0.867</td>
<td>0.637</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ B^*_m = 1.30 \]

\[ \beta = -0.0854 \]

\[ s_\phi = 0.0276 \]

\[ s_\gamma = 0.00754 \]
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Denver, Colorado 80237
Attn: J. W. Reitzer

Whittaker Corporation
Narmco R&D Division
3540 Aero Court
San Diego, Calif. 92123
Attn: Dr. M. Shaw

Yardney Electric Corporation
40 Leonard Street
New York, New York 10013
Attn: Dr. Geo. Dalin